

a thermocouple element supported by said plug and having one end projecting from said immersion end of said tube and an electrically conductive portion extending into said tube beyond said plug,

an electro-chemical cell extending through said plug having one end adjacent to said projecting end of the thermocouple element and [its opposite end] an electronically conductive portion extending into said tube beyond said plug;

a gas impermeable enclosure receiving the electrically conductive portions of said thermocouple and said cell, said enclosure being closely adjacent to said measuring head within said tube;

electrical conductors extending from said enclosure to said connector end of said tube;

an electrical connector closing said connector end of said tube and providing electrical connections for said thermocouple, said cell and said tube;

said tube between said plug and said connector being filled with a heat insulating particulate material which is loosely packed such that it is gas permeable;

a sheathing surrounding a major portion of the length of said tube, said sheathing being made of a fireproof, refractory heat resistant material attached to the exterior of said tube, the outer surface of said sheathing being tapered towards the immersion end of said tube such that a minimum thickness of said

sheathing is directly adjacent to and exposing said immersion end of said tube for minimizing trapped gases adjacent the measuring head when immersed into the metal bath, the opposite end of said sheathing from said tapered end forming a shoulder adjacent to said connector end of said tube; and

an elongated hollow support for receiving said shoulder of said sheathing in an abutting relationship such that the end of said tube is inserted into said support and said outer diameter of said sheathing and said support are substantially the same at said shoulder.

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3 33. (Twice Amended) An immersion measuring probe for measurements in a molten metal bath comprising:

an elongated hollow electrically conductive tube, said tube having an immersion end and a connector end;

a measuring head closing the internal portion of said immersion end of said tube, said measuring head having

a non-conductive support plug,

a thermocouple element supported by said plug and having one end projecting from said immersion end of said tube and an electrically conductive portion extending into said tube beyond said plug,

a gas impermeable enclosure receiving the electrically conductive portions of said thermocouple, said enclosure being closely adjacent to said measuring head within said tube;

electrical conductors extending from said enclosure to said connector end of said tube;

an electrical connector closing said connector end of said tube and providing an electrical connection for said thermocouple;

said tube between said plug and said connector being filled with a heat insulating particulate material which is loosely packed such that it is gas permeable;

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a sheathing surrounding a major portion of the length of said tube, said sheathing being made of a fireproof, refractory heat resistant material attached to said tube exterior, the outer surface of said sheathing being tapered towards the immersion end of said tube such that a minimum thickness of said sheathing is directly adjacent to and exposing said immersion end of said tube for minimizing trapped gases adjacent to the measuring head when immersed in a metal bath, the opposite end of said sheathing from said tapered end forming a shoulder adjacent to said connector end of said tube; and

an elongated hollow support for receiving said shoulder of said sheathing in an abutting relationship such that the end of said tube is inserted into said support and said outer diameter of said sheathing and said support are substantially the same at said shoulder.